REMARKS/ARGUMENTS

Claims 1-2, 6, 7, 10, 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al. (US 5,648,662). Claims 12-13, 16, 18, 21, 25-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamazaki et al. (US 5,365,080). Claims 1-7 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harkin et al. (U.S. 5,705,413). Claims 10-11 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harkin et al. (U.S. 5,705,413) in view of Kawasaki et al. (U.S. 6,426,245). Claims 8-9 and 19-20 are allowable over prior art.

1. Allowable subject Matter:

Claims 8-9 and 19-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response:

The Applicants acknowledge and appreciates the allowance of claims 8-9 and 19-20 if rewritten appropriately. Claim 1 has been amended to include all of the limitations of dependent claim 8, and claim 12 has been amended to include all of the limitations of dependent claim 19. They are now believed to be allowable by the Examiner. No new material has been introduced. Claims 8 and 19 have been canceled. Reconsideration and allowance of the amended claim 1 and the amended claim 12 are politely requested.

2. Rejection of claims 1-2, 6, 7, 10, 23-24:

Claims 1-2, 6, 7, 10, 23-24 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al. (US 5,648,662) for reasons of record, as recited on pages 2-3 of the

above-indicated Office action.

Response:

Claims 1 and 12 have been amended to include all of the limitations of allowable dependent claims 8 and 19 respectively. The amended claim 1 and the amended claim 12 are listed as follows：

"1. A method of fabricating a polysilicon film by an excimer laser crystallization process, the method comprising following steps:

providing a substrate defined with a first region and a second region;

forming an amorphous silicon film on the substrate;

forming a mask layer on the amorphous silicon film;

performing a first photo-etching process to remove the mask layer in the first region;

forming a heat-retaining capping layer covering the mask layer in the second region and the amorphous silicon film in the fist region; and

performing the excimer laser crystallization process to make the amorphous silicon film, covered by the heat-retaining capping layer, in the first region crystallize to a polysilicon film, using an excimer laser to irradiate the amorphous film to make the amorphous silicon film in the second region, which is covered with the mask layer, become partially melted and make the amorphous film in the first region, which is not covered with the mask layer, become completely melted, and grains are grown laterally toward the first region from the interface between the first region and the second region."

"12. A method of fabricating a polysilicon film by an excimer laser crystallization process, the method comprising following steps:

providing a substrate defined with a first region and a second region;

forming an amorphous silicon film on the substrate;

forming a heat-retaining capping layer covering the amorphous silicon film in both of the first region and the second region;

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forming a mask layer on the heat-retaining capping layer;

performing a first photo-etching process to remove the mask layer in the first region and expose the heat-retaining capping layer in the first region; and

performing the excimer laser crystallization process to make the amorphous silicon film, covered by the heat-retaining capping layer, in the first region crystallize to a polysilicon film, using an excimer laser to irradiate the amorphous film to make the amorphous silicon film in the second region, which is covered with the mask layer, become partially melted and make the amorphous film in the first region, which is not covered with the mask layer, become completely melted, and grains are grown laterally toward the first region from the interface between the first region and the second region."

According to the amended claim 1 of the present application, the method comprises forming an amorphous silicon film 114 on a substrate, forming a mask layer 116 on the amorphous silicon film 114. Subsequently, and performing a photo-etching process is performed to remove a portion of the mask layer 116 in the first region 120 to expose the amorphous silicon film 114 in the first region 120, while *the mask layer 116 in the second region 130 remains on the amorphous silicon film 114 and the overall amorphous silicon film 114 are intact.* Then, a CVD process is performed to *form a heat-retaining capping layer 118 covering the mask layer 116 in the second region 130 and the amorphous silicon film 114 in the fist region.* An excimer laser crystallization process is performed to complete melt the amorphous silicon film 114 in the first region 120, and the amorphous silicon film 114, in the second region 130, is partially melted or not completely melted because it is covered by the mask layer 116. *The crystallization starts at the boundary between the first region and the second of the amorphous silicon film 114 to gain preferable crystal quality.* After the excimer laser crystallization process, all the heat-retaining capping layer 118, the mask layer 116, and the amorphous silicon film 114 in the second region 130 will be removed together to form a polysilicon island.

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The characteristics of the present application include utilizing the heat-retaining capping layer 118 covering the first region 120 to reduce the heat dissipation rate so that the amorphous silicon film 114 right under and directly contacting the heat-retaining capping layer 118 can be maintained in a higher temperature environment for a longer time to perform the crystallization, leading to increase the grain size effectively resulted in better crystallization quality (para [0019]).

According to the specification and Fig.1 and Fig.3A-3H of the application of Zhang et al., they disclose forming a base film 2 on a glass substrate 1 to prevent intrusion of impurities from the substrate (col.3, lines 6-8), performing a first etching process to form a gate 3. After removing the photomask layer P1, a gate insulating film (SiN_x) 4 is formed. Then, an intrinsic amorphous silicon film 5 and a doped amorphous silicon layer 6 are formed on the substrate entirely. A second etching process is following performed by using a second photomask P2 to form a TFT island. After removing the second photomask P2, a third photomask P3 is used to perform a third etching process to form source/drain. The third photomask P3 is removed. A passivation film (cap layer) 13 is then formed to protect the whole TFT device to prevent disturbance of the upper surface of the amorphous silicon film 5 due to a laser irradiation. After that, Laser radiation was illuminated from above the device. (col.2, lines 60 to col.3, lines 26, and col.7, lines 17-27).

The Examiner considers that the passivation film 13 of Zhang et al. is the heat-retaining capping layer of the present application in the above-identified Office Action. However, *Zhang et al. never mentions that using an excimer laser to irradiate the amorphous film to make the amorphous silicon film in the second region, which is covered with the mask layer, become partially melted, and to make the amorphous film in the first region, which is not covered with the mask layer, become completely melted so that grains are grown laterally toward the first region from the interface between the first*

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region and the second region.

The differences between the present application and Zhang et al. are listed as following:

(1) The present application performs the excimer laser process to re-crystallize the amorphous silicon film for forming the polysilicon film before etching the silicon film in the second region. However, Zhang et al. first forms the TFT island (etch the amorphous silicon film) and then uses laser to crystallize the amorphous silicon. The fabrication methods are obviously different.

(2) Zhang et al. never mentions to use heat-retaining capping layer covering the amorphous silicon film for reducing heat dissipation rate to provide a high temperature environment in a longer time to re-crystallize the silicon film and to effectively improve the crystal gain sizes.

(3) Zhang et al. is silent about forming a mask layer on the amorphous silicon film to block laser irradiation to keep a low temperature for the amorphous silicon film right below the mask layer. In the present application, the mask layer blocks laser irradiation. And the present application utilizes an excimer laser to irradiate the amorphous film so as to make the amorphous silicon film covered with the mask layer become partially melted and make the amorphous film not covered with the mask layer become completely melted, and grains are grown laterally toward the first region from the interface between the first region and the second region.

Furthermore, the Examiner points that the claims rejected in view of Zhang et al. do not recite the limitations of "removing the amorphous silicon film in the second region and leave the polysilicon film in the first region". However, claims 3 and 14 clearly disclosure that a second photo-etching process is performed to remove the heat-retaining capping layer, the mask layer, and the amorphous silicon film on the buffer layer in the second region after forming the polysilicon film; meanwhile, the polysilicon film in the

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first region is not removed. Thus, the Applicant believes that the present application includes those limitations that are different from Zhang's application. Accordingly, Applicant believes that claims 1 and 12 should be allowable in comparison with Zhang's application.

In addition, claims 8 and 19 were indicated as being allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims. Since the limitations in the original claims 8 and 19 have been added to claims 1 and 12, the amended claim 1 and the amended claim 12 should be allowed under 35 U.S.C. 102(b). Reconsideration of claims 1 and 12 is politely requested. Because claims 2, 6, 7 and 10 are dependent on the amended claim 1 and claims 23-24 are dependent on the amended claim 12, they should be allowed if claims 1 and 12 are allowed. Reconsideration of claims 2, 6, 7, 10 and 23-24 is respectfully requested.

2. Rejection of claims 12-13, 16, 18, 21, 25-26:

Claims 12-13, 16, 18, 20-21, 25-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamazaki et al. (US 5,365,080) for reasons of record, as recited in page 3 of the above-identified Office Action.

Response:

According to the amended claim 12 of the present application, the method comprises forming an amorphous silicon film on a substrate, forming a heat-retaining capping layer covering the amorphous silicon film, forming a patterned mask layer on the heat-retaining capping layer and the amorphous silicon film in the first region, and performing a excimer layer crystallization process to make the amorphous silicon film in the first region crystallize to a polysilicon film, using an excimer laser to irradiate the amorphous film to make the amorphous silicon film in the second region, which is covered with the mask layer, become partially melted and make the amorphous film in the first region,

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which is not covered with the mask layer, become completely melted, and grains are grown laterally toward the first region from the interface between the first region and the second region.

The differences between the present application and Yamazaki et al. are listed as following:

(1) Yamazaki et al. is silent about that the gate 406 blocks the laser to form a heterogeneous interface so as to control the grown direction of crystal grains so that the coating 402, covered by the gate 406, become partially melted and the coating 402, not covered by the gate 406, become completely melted during an excimer laser crystallization process and grains are grown laterally.

(2) Yamazaki et al. do not disclose forming a buffer layer for preventing impure materials from diffusing upward in latter processes and affecting the quality of the polysilicon film (para. [0017], lines 6-8).

(3) Yamazaki et al. never teach forming a heat-retaining capping layer that comprises a silicon oxide layer, a silicon nitride layer, or a silicon-oxy nitride layer and never mention the heat-retaining capping layer is used to decrease heat dissipating rate of the amorphous silicon film for increasing the grain sizes.

Therefore, Yamazaki et al. disclose obvious different method and structure from the method and structure of the present application. Reconsideration of the amended claim 12 is respectfully requested. Furthermore, since claims 13, 16, 18, 21, 25-26 are dependent upon claim 12, they should be allowed if claim 12 is allowable. Reconsideration of claims 13, 16, 18, 21, 25-26 is hereby requested.

3. Rejection of claims 1-7 and 12-18 under 35 U.S.C. 103(a):

Claims 1-7 and 12-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harkin et al. (U.S. 5,705,413) for reasons of record, as recited in pages 4-5 in the Office

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Action.

Response:

Harkin's disclosure never teaches to use *a heat-retaining capping layer to cover the amorphous film in the first region,* which is predetermined to form a polysilicon film, for maintaining the semiconductor film in a higher temperature environment. On the other words, the amorphous film predetermined to form a polysilicon film of the Harkin's disclosure is directly exposed under the energy beam, but that of the present invention is covered by the **heat-retaining capping layer** under the energy beam so as to increase the grain size of the polysilicon film and improve the performance of devices.

Thus, the Applicant believes that the amended claims 1 and 12 of the present application are absolutely different from the Harkin's disclosure. Reconsideration of the amended claims 1 and 12 is therefore requested.

Furthermore, Harkin does not teach all the limitations in claims 2-7, 13-18. For example, Harkin is silent about forming a buffer layer on the substrate for prevent impure materials in the substrate from diffusing upward to the amorphous silicon film or the polysilicon film to affect the quality of the polysilicon film during the excimer laser process, and which is defined in claims 2, 13. In addition, since claims 2-7 and 13-18 are dependent upon the amended claim 1 and the amended claim 12 respectively, they should be allowed if the amended claim 1 and the amended claim 12 are allowed. Reconsideration of claims 2-7 and 13-18 is therefore requested.

4. Rejection of claims 10-11 and 21-22 under US.C. 103(a):

Claims 10-11 and 21-22 are rejected under 35 U.S.C 103(a) as being unpatentable over Harkin et al. (U.S. 5,705,413) in view of Kawasaki et al. (U.S 6,426,245), as cited in page 6 of the Office Action.

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Response:

Claims 10-11 and 21-22 are dependent upon the amended claim 1 and the amended claim 12, and they should be allowed if claim 1 and claim 12 are allowed. Reconsideration of claims 10-11 and 21-22 is therefore requested.

Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

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Sincerely yours,

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